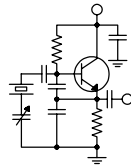


# The Local Oscillator



## *The Newsletter of Crawford Broadcasting Company Corporate Engineering*

SEPTEMBER 2008 • VOLUME 19 • ISSUE 9 • W.C. ALEXANDER, CPBE, AMD, DRB EDITOR

### **And Justice for All**

My subheading here is tongue-in-cheek, and you'll see why as you read on. I'm following up in "The Rest of the Story" style on a topic I addressed back in July, the graffiti-riddled barn at the KLZ transmitter site.

To refresh your memory, we have a steel barn at the KLZ (Denver) site in which we keep the tractor, trailer, riding mower and various other maintenance implements for the three transmitter sites which we own in the market. This barn was at the site when we bought the station in 1992. It's located fairly close to Welby Road, the north-south collector street that the site is situated on, and it's quite visible from the road and from the townhouses across the street from the site.

The character of the neighborhood has been in decline for some time now, and there is a fairly high population of gang members and "wanna-bes." The KLZ barn, situated as it is like a billboard on Welby Road, has for years presented an irresistible target for taggers and graffiti "artists." We fought them off for awhile a decade ago but finally gave up. There was simply no way to keep up with the daily tagging without hiring a full-time painter.

Back in June, we got a citation from Adams County code enforcement ordering us to paint the graffiti out or pay a \$100 per day fine. We got several quotes on painting and found that it would cost us several thousand dollars. We really had no choice but

to paint the barn, but we had to find a way to protect it so we wouldn't be painting it over and over again. So we got some quotes on fencing the barn, again a several thousand dollar project but a necessary one. Contracts were signed and permit applications were filed, and I talked to the code enforcement folks to keep them informed on our progress.

It took awhile – a couple of weeks – to get a building permit for the fence, and then it took more than a week to build it (the contractor initially set the



**It's bye-bye graffiti at the KLZ barn. Note the new fence in the background.**

rear gate posts in the wrong place), but things were moving along nicely. As before, I called the code enforcement people to keep them apprised of the situation.

On the very day that the fence was completed, I got a big surprise. The receptionist downstairs called me and said, "There's a policeman here to see you." That policeman was a Denver deputy sheriff with a summons addressed to me *personally* to answer the misdemeanor charge of

having graffiti on the barn. I accepted service and immediately called the code enforcement people, this time asking for a supervisor. You may not believe what she told me.

After getting her to pull the file on the case and familiarize herself with it, I told her I had been served with a summons. "Why," I asked, "when we have cooperated at every turn and spent a small fortune to develop a permanent solution to this problem?" Her answer: "You should have

immediately painted the barn when you got the citation.” “But based on our past experience, the taggers would have hit it again by morning,” I said. “Then you paint it again in the morning,” she replied. “This could happen every day,” I said. “In the past, we have been tagged night after night.” “Then you paint the barn *every morning!*” she forcefully stated. I couldn’t believe it. I was speechless. I hung up the phone because I might as well have been talking to the cat. Amazingly, they walk among us...

My next call was to the district attorney handling the case. He was much more reasonable and was irritated and even chagrined about it all. I emailed him some photos and got a letter from him dismissing the case in short order.

What a waste of time and effort! And where is the justice in all this? We, the property owner, are being punished for the acts of the criminals while the criminals go free. So much for “...justice for all.”

### E-H Antenna

Many of you read my *Day in the Life* column in *Radio World Engineering Extra*. There, I get to write about where the rubber meets the road out here in the real world of radio engineering. In recent issues, I told about an experimental very small aperture antenna design for medium-wave (AM) broadcasting.

No doubt you have read something about the “crossed-field antenna” in trade publications in recent years. Claims have been great for these antennas, but strangely, no empirical measurements in the form of radial field intensity measurements have, to my knowledge, ever been published for this antenna or any of its derivatives. Several of the antennas are in use by AM stations in Egypt, Italy and elsewhere “over there,” but performance verification data has not been published. As such, there has been a great deal of controversy over these antennas, which are said to work on a little-understood principle whereby the electric (E) and magnetic (H) fields are produced and combined in the same plane rather than in quaderature as would occur in a “normal” antenna. Present variations of the crossed-field antenna are now being called the “E-H Antenna” in reference to this principle.

Back in May, consulting engineer Tim Cutforth built and tested a loop-style E-H antenna at

his test range north of Pueblo, Colorado. Amanda and I were invited to participate (i.e. “free labor”), and we eagerly accepted. I wanted to see this antenna and be on hand to measure its performance. Perhaps we could put to rest some of the controversy if we could show a good efficiency with radial field intensity measurements.

Tim had been provided a complete, working antenna by the inventor, Dr. Maurice Hatley of the U.K., and in addition to that one, Tim built another one out of low-loss components (employing vacuum caps and plated coils). Once we got Tim’s version of the antenna tuned up, we fed it some power and Amanda and I made some spot checks of the field intensity. The results showed an unattenuated field intensity of 4.5 mV/m/kW at 1 km. That’s about 37 dB below the unattenuated field of a quarter-wavelength monopole. I’ve had dummy loads radiate better. We then tried the Hatley-provided antenna and got the same results. Clearly the loop-type E-H antenna was behaving like a very short loop, which is what it really is.

But hope springs eternal, and there is out there another E-H antenna type, this one of cylindrical design. Ham radio enthusiasts swear that it works very well. I decided to build one and see for myself. Because a medium wave version of the cylindrical E-H antenna would be fairly large, I opted instead to build one to operate at 3.8 MHz. If it worked, we could then apply for experimental authority from the FCC and construct a full-size version.

The construction was fairly simple, employing PVC pipe as structural elements, aluminum flashing as radiating elements and enameled #12 copper wire as tuning coils. It took me awhile, but I finally got the antenna tuned to present a good load to the transmitter and fed it some power.

The FIM-41 goes to 5 MHz, so it was no problem to use it at 3.8 MHz. The measurements I made showed a huge improvement over the loop-type E-H antenna: an unattenuated field of 25 mV/m/kW at 1 km, only about 22 dB below what a quarter-wave monopole would produce.

I was “hopefully skeptical” throughout this process, but I knew deep down that you can’t cheat the laws of physics. Just as the loop-type E-H antenna is a very short loop, the cylinder-type is a very short,



fat dipole. As such, it has a very low radiation resistance, probably on the order of a couple of tenths of an ohm (good luck measuring that!). With such a low load resistance, the  $I^2R$  losses in the matching coils were very high. Most of the power was used to heat the coil wire and PVC form.

So why do a lot of hams swear the antenna works? I think it's simple: ionospheric propagation. Hams get to take advantage of very low-loss propagation via ionospheric reflection, a big RF mirror in the sky. It doesn't take a lot of signal to get from point A to point B in this mode. You're looking mostly at free-space loss plus ionospheric reflection loss. A quick calculation for a 200 mile path at 3.8

MHz assuming 100 watts transmitted from the 75 meter E-H antenna and good ionospheric reflection shows the receive signal will be on the order of 5 uV/m. Use a full-size (half-wave) receive antenna and you're looking at S9+10dB or better on the receiver signal meter.

So... to my satisfaction at least, I have shown that there is no magic in the E-H antenna. It works as one would expect a short, fat dipole to work. It has its uses, particularly on higher shortwave frequencies where wavelengths are shorter, but don't look for AM stations to start replacing their full-sized towers with fat, stubby E-H radiators.

---

**The New York Minutes**  
**By**  
**Brian Cunningham, CBRE**  
**Chief Engineer, CBC – Western New York**

Hello to all from Western New York! I can hardly believe that September is here already! This year seems to be flying by at the speed of light. It seems as if only yesterday I was planning out my to-do list for 2008. The year is two-thirds over and I still have numerous projects to complete before the snow flies. I am thankful for each and every day, but I sure wish that time could slow down just enough so I can get the majority of my outside projects completed.

In August, the Buffalo chapter of the SBE hosted the Taste of NAB Road Show presented by Larry Bloomfield. If you have the opportunity to attend this presentation, by all means do so! It is a smaller version of the NAB equipment show, and is very informative and hands-on. I was especially interested in the new EAS encoder/decoder designed and built by Trilithic of Indianapolis. The EASyCAST encoder/decoder has four built-in programmable tuners including AM, FM and NOAA. It also features four analog/digital outputs along with 10/100BaseT Ethernet port for routing to data streams or for remote monitoring/connectivity. There is no built-in messy printer to deal with; all EAS tests sent and received

are held in a buffer and can be sent out to any external printer via the communications port. The EASyCAST would be an ideal replacement for our

**Time-For-Trouble** units.

Switching gears, have you noticed recently the number of jobs available in television engineering? The television engineering industry has caught up with the engineering shortage radio experienced in the mid-eighties. It appears that college graduates are setting their sights on computer related fields, and more technical, higher-paying jobs. If you check the SBE careers online jobsite, the number of television engineering positions outnumbers radio by a ratio of five to one. I know that here in Buffalo, all three of the major stations have numerous positions open in their engineering

departments and have been looking for months to find suitable engineers to fill these jobs. As far as radio goes, consolidation has helped reduce the demand for engineers, but as a lot of engineers creep toward retirement age, there are no young, energetic replacements to fill these jobs. In my six years here at CBC, I don't recall anyone stopping by to inquire about any openings in the engineering department, and I'm pretty sure that this trend is occurring all



around the country. We need to come up with some way to get young people interested in our profession.

#### **WDCX – Buffalo**

This month in Buffalo, we began installing the new LED lighting on the WDCX tower. Don Boye of Western Tower Service first installed the lower side lamps, which are located well below our 6-bay auxiliary antenna. As we only utilize the auxiliary antenna for our 350-watt HD-R signal, Don was able to safely work on this level without the need to reduce power on or turn off the digital transmitter.

A few days after installing the lower side markers, he scheduled to replace the incandescent beacon with a new LED beacon. On Thursday the 14<sup>th</sup>, Don and his helper removed the old beacon and installed the new one. The only problem they encountered was that the 1-inch connectors in the electrical junction box had seized up and couldn't be twisted open. As a temporary measure, the electrical wiring was spliced into the old pigtail feeding the beacon. In order for this installation to be done properly, Don will have to take a torch up to the junction box and apply heat to the connector until it can be removed.

In the meantime, I began wiring up a new tower light controller/indicator for our remote control tower light metering and status. The old tower light wiring inside the building was horrible, so I took this opportunity to get this wiring cleaned up and done properly. Next month I will include a photo of the new lighting controller.

On Monday the 11<sup>th</sup> of August, we had a pretty nasty thunderstorm move through the Western New York area. Lightning took out both our phone lines at the transmitter site and a surge protector I had installed on the Burk remote control. I can't recall the number of times I have had to rebuild the I/O cards on the Burk remote control in years past because of lightning strikes to the phone lines. The surge protector did its job and saved us from another \$100 I/O repair

kit.

#### **WRCI / WLGZ – Rochester**

This past month, I replaced the old Potomac AM-19 antenna monitor at the WRCI transmitter site with a new Potomac 1901 digital antenna monitor. Before the old AM-19 could be removed, I had to adjust each tower for the exact licensed parameter reading on the AM-19, and then compare that reading with the reading obtained on the new 1901. This had to be done for all six towers, on both day and night patterns. Once this was completed, I then needed to check all the day/night monitor points to insure that all were within limits. Once all the information was compiled, it was sent to Cris so he could prepare and submit Form 302 to the FCC to reflect the changes in the array parameters.

In the meantime, I am programming the new Burk VRC-2500 remote controls to be installed at both transmitter sites. The Burk AutoLoad program has greatly improved from past versions, and the pre-programming has gone quite smoothly, with no surprises thus far.

Several months ago, I reported that someone had removed several of the wooden fence panels at the AM tower site to get a look at what was inside the tower enclosure. No other damage was noted, and none of the copper ground system had been disturbed. Since that time, I have kept close check on our six tower enclosures and have not noticed any other signs of tampering since the initial incident in May. I am hoping that this was just kids being curious and not some crazed dope fiend looking to make a little cash to support a drug habit. I have heard some really horrific stories of what kind of damage these thieves can and have done, and we are indeed fortunate that we have not experienced any other incidents of copper theft at our other transmitter sites.

That about wraps up another month here in the great northeast, and until we meet again here in the pages of *The Local Oscillator*, be well and happy engineering!

**The Motown Update**  
**By**  
**Tom Gardull, CBRE**  
**Chief Engineer, CBC–Detroit**

I have a bunch of little things to share this month. There is no unifying theme, other than how engineering can be involved with many things.

We had two programs whose audio confused us so much that we switched to the backup transmitters. Every weekday morning at 9:05, the WEXL silence alarm would sound and we would hear nothing on the air until we switched to our backup transmitter. I would go to the transmitter site, find all okay, return to the main transmitter and all was well until the next morning. Our board op was prepared, having the remote control at the ready for the switch every morning. Finally, I stayed at the site one Friday morning to be listening and watching at 9:05. I was listening to the Boston Acoustics HD Radio and I heard the audio sound fine at 9:05. But our board op switched transmitters and called me to say the audio was gone. I switched back since I had audio, but then looked at our mod monitor, which was displaying L+R mode and it was near zero. I quickly returned to the backup, whose audio was not great but at least was there. Then at 9:12, the audio was back to normal.

I recognized the symptoms. The audio from the national ministry was out of phase during the eight minutes of the message recorded at a church. The five-minute open and the two-minute close were in phase. The message always started five minutes into the broadcast. Our silence alarm is from an L+R source and thus had the cancellation. The site radio is stereo and I could hear the individual channels. But our processor perfectly cancelled the channels in mono for most of the listeners. Our backup transmitter feed worked because it was not a perfect balance and thus was not a total cancellation.

We were able to correct the problem with the program by editing an obviously mono program by using left channel audio into both channels and then notifying the ministry. This brought to our attention that our Wheatstone consoles do not have a mono bus meter, unlike our previous consoles. A



mono meter would have been a good diagnostic tool.

We had a similar problem for WRDT. A digital clicking artifact was heard during a program. Our IBOC exciter had a similar problem last year, so that was our first suspect. We switched to our backup transmitter at 730 AM and all was well. But my trip to the transmitter site showed everything was fine there. We went back to the main and the IBOC exciter. Then at 3:00 PM, there was an encore playing from NexGen of the same program and there was the clicking again. The program was the problem. It was leaving the studio with a problem. We pulled the source CD and found that every Thursday program had this clicking

problem. The ministry was notified. What happened in the morning was that we just happened to switch to the backup as the bad audio was ending at 7:30. Had we delayed another minute or two, the audio would have been clean.

I have been repairing our Austin tower lighting transformers at the WRDT day site. Weather, especially falling ice, has scraped away some of the outer covering around the coils. Austin supplies a gauze cloth to wrap around the windings. Then this bandage is painted with a sealer called “glyptal,” which hardens the gauze as a new skin. A beat-up transformer can really look new and be protected after this treatment.

I have been trying to install a Moseley LanLink for WRDT. It is an experiment to see if a 4-watt spread-spectrum device can cover the 40-mile path from the studio. So far, it has not worked. I also set up a test at the studio with one Lanlink attached to the STL and its twin at ground level alone using an old cell-phone antenna. With this, they did communicate when 400 feet apart. It was also interesting to view on a spectrum analyzer. You can see the carrier as its frequency hops around the band. When I changed the trace to “hold,” the band quickly filled in the screen. It is an interesting concept and we are going to try to make it work here.

### News From The South

By  
**Stephen Poole, CBRE, CBNT, AMD**  
Chief Engineer, CBC–Alabama

#### **Congratulations**

First, I'll add my congratulations to Cris Alexander for being named the SBE's Engineer of the Year. He's one of the sharpest guys I know and I'm not the least bit ashamed to admit that I've learned a lot working for him. This particular award is especially appropriate, though, because of Cris's efforts to improve the art, and to attract and educate young engineers for our business. I can't think of an award that's more appropriate for him.

#### **WYDE-FM Revisited**

As I write this, the depleted remnants of tropical storm Fay are finally moving out of the area, leaving behind several inches of rain, some flooding and scattered power outages. Not nearly as bad as Katrina or Ivan, mind, but we've had non-stop rain for days now. This is just the latest event in what has turned out to be a very hot, humid and stormy summer.



**A burned-out bullet produced damage below the joint**

the crew got to bay #6, they found that the bullets had cooked off, burning the line for several feet in each direction. Molten copper had dripped down into the

line below the burnout as well.

Not good. We had no choice but to drop the entire antenna to the ground for a complete cleanout and rebuild. We ordered Teflon insulators and bullets from ERI (I had some Dielectric inner sections on hand) and got to work. The biggest problem – once again! – was the humidity. Each night we'd store everything in the air conditioned transmitter building and all that metal would get cold. As soon as we'd move it outside, moisture would condense with a vengeance. We had water streaming everywhere. When you add in

like mad, it was just a glorious thing. We went through several rolls of shop towels and a half gallon of denatured alcohol just keeping everything clean and dry while we reassembled it.

This is something that the books and engineering papers don't adequately cover, even though it definitely falls under the heading of, "things you need to know as a broadcast engineer." The references just say helpful things like, "the inside of the line must be absolutely clean and dry" and "don't get finger oil, grime or sweat on the connectors." What they *don't* tell you is *how* to accomplish this when it's 95 degrees at 85% relative humidity! I'd like to share a few tips in the remainder of this month's column, most of which come directly from this most recent experience with WYDE-FM.

#### **A Clean, Dry Line Is A Happy Line!**

Of course, the references are absolutely right: even a small amount of moisture in an air-dielectric transmission line can cause corrosion, signal losses and arcing. It's also true that no line is perfectly sealed, especially not as it ages and the seals become less flexible. Then you add the real world component: one part of a line that's in direct sunlight could be extremely hot (I've measured 180 degrees



myself) while 50 feet away, a section that's in shade is much cooler (same case, I measured 80 degrees – a 100 degree difference). This causes uneven expansion and contraction, exacerbating the problem. Plus, a section that's extremely hot at mid-day will cool down after dark, so you could have a change of over 100 degrees in a matter of hours, further stressing the line.

To help keep moisture out, the standard practice is to pressurize the line with dry gas; typical values are 3-5 p.s.i. with a dew point of at least -20 degrees (the lower, the better). Many engineers just use commercially-bottled nitrogen and a regulator. This has the virtue of simplicity, but it also has drawbacks. You have to pay for regular deliveries and the tanks are bulky and heavy. The worst downside is that if Bubba uses your tower for target practice and punctures a line, that nitrogen will very quickly be exhausted. A pump-driven system that uses free air might be able to hold enough positive pressure on that line to keep out the rain until repairs can be started.

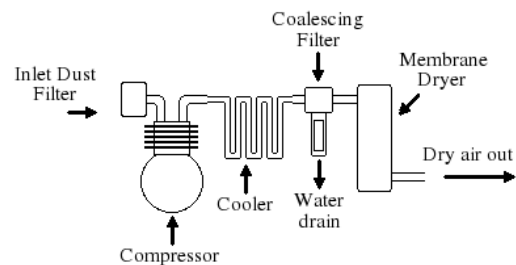
Of course, you shouldn't just use a stock two-gallon compressor from the local auto parts store to fill a line. The air around us, even in a sealed building with HVAC, will have water vapor in it. Standard HVAC units aren't designed to remove all moisture, because people will complain if the air is too dry. This isn't a problem at the home or office, but that air simply isn't suitable for pressurizing a transmission line. While an air-conditioned transmitter building will certainly help, you have to take an extra step to make that free air really dry. That's where a dehydrator comes in.

### Dehydration in the Real World

The simplest dehydrator pushes air at relatively low pressure through a desiccant chamber and then into the line. This works fine in many cases, though you do need to monitor the desiccant and replace or recharge it when it becomes moist. Typically, the desiccant (or a window filled with indicating grains) will change color when it's time to service the unit.

Be prepared for when the HVAC fails, too! As Fay swept through, the air conditioner at WXJC died. The emergency ventilation kicked in, pulling thousands of cubic feet of warm, moisture-saturated air into the building. WXJC's dehydrator decided to top off the transmission lines right about then ... and the desiccant was fouled in a *single fill*. To be safe, especially if you live in a humid climate like ours, you really need to remove as much bulk moisture as possible before the air even gets to the dehydrator.

As it turns out, the Andrew MT-2000 that we use at WYDE-FM has given me some ideas. That site has 1300 feet of 5-inch coax and 1000 feet of 4-inch rigid line. Even with that industrial-strength dehydrator doing the work, it still takes hours to fill those lines. Fortunately, this thing doesn't use a desiccant chamber; it has a membrane-type dryer. But after looking closely, I realized that the bulk of the moisture removal doesn't happen before it gets to the membrane. Here's a simplified diagram that shows how Andrew has combined a trick from industrial pressurization with that membrane to produce 2 SCFM at a dew point of -50 degrees.



Any time you pressurize air, the temperature and the dew point (the temperature at which water vapor condenses) will go up. Most simple desiccant-type dehydrators operate at relatively low pressures, so this isn't an issue with them. But once you get above 30 PSIG (approximately three atmospheres), the rise becomes significant.

Here's the trick as shown in that diagram. If you cool the hot air from the compressor *without lowering the pressure*, the water vapor condenses into a liquid that can easily be removed with a simple moisture separator or coalescing filter. A large workshop compressor might have a big aftercooler with a fan; the MT-2000 gets by just fine with a simple passive radiator. The coalescing filters do the heavy lifting and the membrane dryer just does the "finish" work, lowering the final output to a dew point of at least -50 degrees.

How effective is this? While I was purging and refilling WYDE-FM's line with our current horrible humidity, the coalescing filters (the MT-2000 actually has two of them, in series) got waterlogged more than once. Had all of that moisture made it to the membrane, it probably would have become fouled. That gave me some ideas for my other dehydrators that I hope to report on here in a later issue. Simply putting a coalescing filter in front of a low-pressure pump won't really help, but I'm looking at a way to duplicate this effect with all of our dehydrators here.

### **Finally: Practical Purging**

When installing a new line, or after repairs to an existing one, you have to rid it of all moisture, dirt and contaminants. While doing the assembly, use denatured alcohol and plenty of dry rags to wipe all surfaces thoroughly. With rigid line, take one of the inners and make a swab of shop towels; push it through several times. Then wipe the inner. Once you're done and everything has been put together, it's time to do the final purge.

The standard method is to fill the line, drain it, refill it and repeat several times. Jim Coleman of Southern Broadcast Services showed me a better way several years ago (and he says that he, in turn, learned it from an engineer named Dean Shepherd). He recommends that you vacuum the line. At very low pressure, water boils at room temperature. When you refill the line with clean, dry air, it'll take longer (because you have to add one atmosphere of pressure plus the 3-5 lbs that you normally want), but trust me, this works – especially in the real world here in Alabama, where just popping a line for a minute to check a connector can result in a lot of moisture sneaking in.

You can buy a standard vacuum pump, or you might modify your dehydrator to do this. Go to Lowe's or Home Depot and buy some ball valves and extra fittings so that you can quickly switch your transmission line to the inlet or outlet. But be very careful not to leave the pressure gages on your transmission line connected when you vacuum; it'll "suck the needle backwards," which will make the gauge inaccurate at best, and could even destroy it in the worst case. (Speaking from sad experience – you can profit from my dumb mistake!)

How low can you go with the pressure? Jim (and common sense) says that you shouldn't do this

with thin-walled waveguide; a hard vacuum will cause it to collapse. But with most any standard coax or hard line, you can vacuum that line as low as your equipment will take it. As Jim says, let it run until the pump starts growling! If you don't have a vacuum gauge, monitor the output fitting with a moistened finger: when the line is evacuated, no air will be come out of the pump.

You want the pressure as low as possible to get a low boiling point, which will help remove even tiny droplets of moisture that might have lodged in the little nooks and crannies. Once you've drained the line as low as you can get it, then refill it with clean, dry air. If you can't get a hard vacuum (or close to it), repeat this process a couple of times.

### **That's It!**

One final, personal note: Todd Dixon, one of my assistants, sometimes calls me "obsessed" about stuff like this. When I have questions, I go looking for answers in the evenings at home, usually via endless Web searches. When I was researching this, one name that popped up was James Clerk Maxwell. We know him best for his electromagnetic theories, but he also did a good bit of work on gas and pressure as well. (For a famous intellectual exercise, look up "Maxwell's Demon;" for extra credit, do a Web search on the "vortex tube," which some physicists think actually implements it.) Maxwell's biographers rarely mention this, but the man was a devout and committed Christian in addition to being a certified genius. That gives me a good bit of personal satisfaction, and I hope it does you as well.

That's it for this time; we're keeping an eye on Hurricane Gustav as I write this. If the early track forecasts hold true, he could become another Katrina. Not good news, so keep us in your prayers!



## Gateway Adventures

By

**Rick Sewell, CBRE**  
Chief Engineer, CBC–St. Louis

The past month saw us move into the digital audio domain as we installed a new control board for KJSL. The new board is a Wheatstone D-75 and is part of an overall movement to make the entire audio chain for both of our St. Louis stations digital.

Having worked with the Wheatstone boards in the past, I was fairly familiar with the layout and configuration of this board; the design obviously has similarities to other control boards they have made in the past, so this made it easier for me to do the install. I would also think it will be easier for the board operators to acclimate to the change in boards as well.

I really enjoyed installing both of these boards. Other than having to crouch down to punch down wires inside the cabinet where our punch blocks are located, it was really fairly easy since the connectors are the same ones used in D-sub connectors for computer com ports.

The first thing that I noticed after getting the first board installed in the KJSL control room was the sound, especially the quality of our automation's audio server. Before this change, we had fed the audio servers analog audio through about 125 feet of multipair cable through a conduit run from the rack room to the control room. It didn't sound bad, but when compared with the digital signal that we are now providing from the audio server, the difference is quite noticeable.

I was very pleased with the digital audio

quality. I look forward to getting the rest of the audio chains switched to an entirely digital pathway all the way out to the transmitter sites. I am sure I will be able to notice the difference in our on air sound. I expect to hear a real difference in the sound of our Internet streams after all is completed as well.

The boards have a nice physical appearance that is very sharp. The word modern is probably over used in these circumstances, but that is what comes to mind when describing the look. It does that without looking like it's trying too hard to have that look. I don't know if that makes sense, but I didn't want to wax too poetic when describing the physical appearance.

So far, most of the operators have had no difficulty running the new board nor did they need any special training. I think that is due in large part to the similarity in function and layout to the previous board, which was an Audioarts R-60. We also kept the fader assignments fairly similar to the older board, which I am sure added a lot of comfort level and gave them some instant familiarity.

At the time of this writing, I am halfway through with installing the other D-75 board in the KSTL control room. The time of the installation has decreased because I have the experience of the first install behind me. Although we are only a few weeks into using the D-75 boards, I am very pleased with the results.



**Catalina Tales**

**By**  
**Bill Agresta**  
**Chief Engineer, KBRT**

Greetings from Santa Catalina Island! I cannot believe that summer is almost over! Where did it all go? It seems like I have been busy chasing from one project to the next and never had a chance to even realize that it was beach time. I did just promise my son that I would take him camping at Shark Harbor next weekend, but only because writing this September article caused me to realize that the season is almost over. I guess this year I can blame it on the weeds! I usually spend a few weeks or a couple of months max dealing with brush clearance here, but then the job is over. Not anymore, not since the fire. These weeds grow as fast as I can cut them down now. I am beginning to realize that this is my new full-time job, and it seems like it will never end!

After almost an entire month in the shop, I finally have my truck back! As you know, this place moves on what we call "island time," and this can sometimes become very frustrating. This was the case with the repairs on our Toyota truck. The awful conditions of the Conservancy roads here on the island have been taking their toll on our truck, and last month, it finally got to the point where it was not safe to drive.

The Tacoma developed some broken parts in the suspension and caused the front end to feel like it was about to fall off (some other Toyota trucks on the island did experience catastrophic front-end failures). Our mechanic, who is a highly qualified and skilled one at that, took our truck into his ever growing line of vehicles that are falling apart because of this pothole paradise we are forced to drive everyday. It has become so bad that just in our driveway alone I now end up with at least one broken vehicle per week, including tour buses, big Edison trucks, and even the tiny Subaru and Tiger trucks a lot of people drive here on the island. Nothing is immune.

We have decided to get a bit creative in the

way we go about repairing our truck, since welding the body parts simply causes the joints to rip apart faster. We are now beginning to use a metal epoxy to bond the parts back together, and it seems to be working much better than welding so far. We have also found a supplier who offers parts made from a composite material that is said to hold up in rough environments longer. At this point we are looking for *anything* that might work better than the stock parts we seem to go through like they were made of brittle plastic.

Repairing our truck this time around proved to be more challenging than last time as our mechanic continued to find more issues each time he test drove it. Each new issue caused him to dig deeper until we finally decided to just tear the entire front end apart and inspect everything. So, as of now, our truck is in good mechanical condition and I am continuing to make modifications to a few more body parts and to the overhead lumber rack. Thanks to our good friend Ralph Morrow, who graciously let us borrow one of his cable TV trucks for a good bit of the time our truck was in pieces. I did end up in the position a few times of having to walk down the hill into town, but thank God I always ended up with one of Ralph's trucks or a ride from someone on my way back up to the transmitter plant.

Inventory time is always a good time to do a deep cleaning here, and I am always shocked to find all kinds of things I did not know were here. My son adds to this more often than not, but here and there I still find an old treasure from the past. This was the case last week as I decided to clean the cable trays beneath our floor and found some old Catalina Island currency. Yes, you read that right! Back about twenty years ago, the Chamber of Commerce decided to organize our local retailers to accept Catalina's very own currency. It was hoped that this would benefit our economy by making people want to spend more



(and spend everything after they already made the exchange from USD to Catalina currency). Although some people did just that (and some kept some of the currency as souvenirs), the plan eventually failed as it proved to require more and more resources to continue. Now these little tokens are just another memory from our little island.

Last week I got upset after I realized AT&T had finally finished repairing their Telco poles, lines and all but left us without restoring our DSL service! It took them over a year to make the needed repairs after the fire burned down many of the poles and lines near our plant here on the island. Through this they continued to put us off and tell us that our DSL would

be restored only after they were able to install a new fiber node near our driveway. Well, they put a box on the pole, but after everything (besides or DSL) was repaired, the box disappeared along with the entire crew as they left the island. Now I am back to wrestling with AT&T to get what we already had and relied on restored. I cannot believe what AT&T has turned into over these last few years. Their customer support has gone from bad to right down absurd!

Until next month, the Lord bless you and keep you; the Lord make his face shine upon you and be gracious to you; the Lord turn his face toward you and give you peace.

---

### The Chicago Chronicles

By

Art Reis, CPBE, CBNT, AMD  
Chief Engineer, CBC-Chicago

#### Tyranny at the FCC

Now, let's see if I have this right. A station in Virginia was recently busted for running too many Required Weekly EAS tests in a week. Really? Oh, well, not entirely. It seems that the release of the "extra" test was actually "inadvertent," as in triggered accidentally. But, and here's the disconnect, the FCC's EAS section considered this to be a willful violation and has sent the station a Notice of Apparent Liability (NAL) and assessed a fine of \$5,000!

No, this is not some small station operator who got pinched for such "egregious behavior," either. It was WKHK FM, a station in Virginia, not far from Washington, DC, a station owned by Cox Broadcasting, one of the oldest and most respected of all the old line broadcasters, the owners of powerhouse WSB in Atlanta. This is a good broadcaster. One of its past general managers, Ward Quaal, wrote the book on good broadcasting, which is one of my college day staples. I still have that book.

So, what went wrong? Nothing, really, although the FCC would have you believe otherwise. According to the NAL, the act of sending that EAS test was *willful*. Really? Read further down the Notice and you'll find two things: First, only one

complaint was filed, and that by a listener, *a lay person*. That lone complainant "alleged that similar EAS tone interruptions during the WKHK regular

broadcast programming were a recurring problem" (from Paragraph 2 of the NAL). The complainant offered no proof that we know of to back up that statement. Remember, this is a complaint of *one person, a single individual*, a lay person who probably doesn't understand the nuts and bolts of EAS to begin with and assumed that the station had aired an RWT with the two-tone signal, which by definition

cannot happen. That's a pretty thin case on which to pursue an NAL, don't you think? Talk about a majority of one!

For its part, Cox Radio responded that it knew of only that one incident involving an unscheduled EAS test, that the sending of the test was inadvertent, that the studio operator involved had notified the station chief engineer of the event and even asked how it could have happened. According to the NAL, Cox Radio, in its response to the FCC Letter of Inquiry (NOI), noted that the station CE had explained to the operator what had happened, had logged the incident and initiated retraining of its studio operators. That was supposed to be that. The CE reported that, to the best of his knowledge, this



was the only such incident and that it was “not part of a larger pattern.” This is how a responsible licensee does business with the Commission.

That should have been the end of it, but no. Remember this: One complainant, one complaint. That’s all it took. “Why should that be?” you should ask. Why, indeed? There are certain instances where the Commission’s acknowledgment of one complaint as the start of an NAL is called for, most often where something truly egregious has occurred and the person who snitches is on the inside. This case is nothing like that. First of all, WKHK’s actions here weren’t egregious. It’s an extra EAS test in a week, for criminy sakes! Tell me, where is the harm in that?! Furthermore, this station has more than one listener. How many more of them complained? *None*, except for this one knucklehead, who, under the circumstances, deserves to have his complaint read, then made into a Michael Jordan jump shot into the wastebasket. Why? Because there is no law against sending an extra EAS RWT test in a week, that’s why! Go ahead, look it up!

Here’s another angle. The FCC reports that the complaint involves an EAS tone. Does that mean the “data tone” or the old EBS two-tone alert (the 853/960 Hz)? That isn’t made clear in the NAL, and that, to my mind, that evidence (or lack of it) is telling. Besides, this was apparently a weekly test which was sent, since the transmission of an RMT (Required Monthly Test) is either done automatically, or if manually, requires the operator to jump through more hoops than it does to operate the station remote control by phone.

In his response to the release of the NAL, the very respected head of the Illinois EAS committee, Warren Shulz, whose day job is that of CE at WLS-AM/FM in Chicago, begs the same question, except that he *guesses* that WKHK accidentally aired a required weekly test (RWT). But we won’t know that for sure since the FCC didn’t make that plain in their NAL. Do *they* even know? Frankly, unless they tell me otherwise, and under oath, I rather doubt it.

Let me tell you a little something that many of you already know about the EAS system as it presently exists: We learn most about the limitations of the system when someone makes a mistake, more than we could ever learn if all of us operated it perfectly.

For instance, one of the most instructive episodes in the storied history of national emergency communications occurred right here in Illinois on June 26, 2006, when an *inadvertent* glitch in a piece of EAS equipment at the Illinois State government

offices in Springfield precipitated a false state-wide alert which did much to expose possible failures of the Illinois State System, not to mention possible failures elsewhere. At that moment, the world could have blown up and Peoria, Illinois would have been blissfully ignorant of it. Why? Because an important state radio link to that area was down *that day, for routine maintenance*. That’s a systemic problem, one which was discovered by accident, and something important to know. Thus, we can safely judge that the “accident” was in the public interest and, from all appearances, was treated as such.

That being the case, then why the inconsistency, the reversal of a good policy, here? Why suppress, by threat of legal sanction and monetary forfeiture, the best way we have to uncover such systemic mistakes? What if we here in the engineering department at CBC-Chicago wanted to send an extra EAS RWT just for the purposes of exposing or checking out a possible problem in our own system? Truth be told, we’ve done such things in the past, although we’re not going to tell anybody when. Not now, we’re not. And frankly, we’re going to think twice about doing anything analytical with EAS in the future which involves putting it on the air, if this is the way the Commission is going to deal with such an issue. And since when is that in the public interest?

Warren Shulz, in his email on this issue to Tom Beers of the FCC’s EAS section, adds something which bumps that question up to another level. Shulz stated, “[This] NAL has now put a new edge on what is a hybrid voluntary and regulated event and equipment. I have seen my share of equipment problems with EAS. Going forward with a replacement system [such as the new Common Alert Protocol (CAP) 1.1 being pushed by FEMA; see below], *I don’t see it getting better, adding more layers of complexity.*” [Emphasis mine—ar] And he’s right!

It is axiomatic in any system that the greater the number features and options built into it, the more complex such a system becomes, the longer is the learning curve for any person seeking to become proficient in its use and the greater the possibility of mistakes occurring, such as the one which may just cost WKHK \$5,000. If you don’t believe me, just ask NASA about it.

Here’s another angle: We here at Crawford, in order to remain compliant with the FCC’s to mandate regarding the sending of EAS tests on our HD-2 channels (and CBC is likely not alone in this), simply simulcast the tests sent out on our main channel on HD-2, never minding what HD-2 is

sending out to the listeners at that moment. Will such a practice make us liable for an NAL should a single one of our HD-2 listeners complains about that to the Commission? I bet it will, and I'm putting on my near-term do-list a redesign of my EAS box switching setup to allow for independent broadcasting of EAS RWTs and RMTs on each service, with just our one EAS box per station. It may be an unfunded mandate from the FCC that we have here, but I don't see the point in wasting the company's money by funding a second EAS box just for HD-2 service, just to satisfy that mandate.

So, from what we know of the FCC's newest policy, as delineated in its NAL against WKHK, if you want to see more stations getting nailed with more NALs by the FCC, then just go to the new, far-more-complex CAP 1.1 system, and don't fight the Commission when the EAS bureau gets a letter of complaint from just one of your crank listeners about how your station screwed up on a required weekly test. Do you believe that the Commission is thus looking at the possibility of greater government revenue enhancement? Do you really think that, under those circumstances, the new CAP 1.1 system is going to gain acceptance, or get any meaningful participation at all from local stations, especially the smaller station owners? Do you think that CAP 1.1 will happen at all, especially if we broadcasters are made to foot the bill for all this new equipment ourselves, as the result of an unfunded mandate from FEMA, like we broadcasters had to do with EAS? Do you think we want to participate and not to fight such a conversion, under those circumstances? Are we going to have to get the Congress involved on our behalf, God forbid? Does this sound like a government of the people, by the people and for the people?

I don't think so, and so much so that, for me, there's another word for this, one first used in this country back when we were fighting the Revolutionary War. That word is "tyranny," and like it or not, that's exactly what we have here, in the form of that NAL to WKHK, and in the Commission's attitude in reaching the conclusion that they did in this matter.

I'm hoping and praying that Cox Radio will fight this NAL tooth and nail, and that they win. Yes, it will certainly cost more to take this one for the team than it would to just pay the fine and move on, but then the question becomes, move on to what? This action by the FCC, this time, is not the action of the leaders of a free country. It has, instead, more in common with Soviet Union of the Stalin era, and we all as broadcasters owe Cox Radio as much help and

encouragement as we can in their fight against this NAL.

What do *you* think?

### **Remote by IP**

August 22, 1968, forty years ago, I lost one of my best friends, Jan Bauer, to a toxic mixture of two medications. She was 21 and not in good health. Each anniversary of that date has always been a wistfully sad one for me, but this year, something happened on August 22 which was a milestone in my career in this business, and something to celebrate. For the first time, we broadcast on WPWX a four-hour program from a remote location, out in the middle of nowhere, and we did the remote site-to-studio audio link via the Internet using our new Telos Zephyr IP with a non-wired UMTS linkup, via the Sprint Network. It's not our first remote via the Internet, but it's the first one which really worked.

The sound? Spectacular, and in stereo. The latency? Low, under 100 milliseconds. It's not exactly Nirvana yet, but it's getting close.

Now the system is not without problems, and we had them with our ZIP (as we, and Telos, fondly call this box). This is because we added that Sprint UMTS box to the ZIP right from the start. We had to.

Of course, the first thing we did when the ZIP walked through the door was to set one of the boxes up in the studios and the other in the rack room, establish a connection, and put audio into it. Impressive. Cris Alexander was here at the time, and he said it was. But that's a wired system, set up strictly in-house. We control the firewall and everything else. It's a different story out there in remote broadcast land, where the average customer's IP system is a nightmare of folks not knowing what they have, firewalls which I swear were set up long ago for the sole purpose for preventing our ZIP box from connecting with anything on the Internet, and with no documentation, and IT people who are on call and don't know anything about what their customer has, even if they installed the system themselves. Oh, yeah and they charge up the wazoo to set up your customer's system to accept your ZIP box. That's why we had to get the UMTS box right after we got the Zephyr IP box.

The thing is, when we tried to get the UMTS box talking with our particular ZIP box, it wouldn't. The UMTS worked well with all of our PC's and laptops (I have the drivers installed on the very laptop with which I am writing this article) but it wouldn't connect with our ZIP. The factory couldn't get it to work, either, by remote control over the

Internet, and finally, after two weeks of this insanity, they were the ones who actually threw in the towel and paid for shipping both ways to see what the heck was going on with this pair of boxes.

What they found was a glitch in the software. That's right, the software was loaded wrong at the factory for some reason. So, they blasted it out of there and re-loaded the whole thing. That did it. The boxes got back on speaking terms, and the system started behaving itself. The factory boys watched it for a couple of days and then sent it back – just in time for our Friday night remote from nowhere.

And the thing worked beautifully. Almost.

It seems that there's this little problem with setup retention. You store your parameters in the ZIP box and you use it, then unplug the ZIP box and take it home, or to the next remote. And then you have to reprogram the thing the way that you desire, again, because the box has forgotten what you taught it during the electrical downtime between sites. That's glitch that Telos wants the units back to fix. I say that a software update would do it.

That's about the only problem that the box has, at least that we could find in this short period of time. There are, on the other hand, a lot of good features in the ZIP. The learning curve isn't bad, although the manual, which is on CD and requires printing, needs a little work to make it more easily understood. That's a job I wouldn't mind having. The front panel screen and buttons are very handy, and I particularly like the on screen map which tells you where the server is to which your Zephyr is connected for your remote. The one we found is in New England somewhere. That's the beauty of this system. When you buy a Telos Zephyr IP, you not only get the box or boxes, you get the services of this server, which keeps your packet communication from dropping out and helps keep your latency low. I've run a couple of remotes in the past which used the Internet, but without these Telos ZIP boxes, and we'd have audio drop out of the system for a number of minutes at a time. This "intermediate server" system makes certain that this doesn't happen and is the key to the acceptance of the Internet as a reliable means of broadcast remotes. I'm sure that across time, there will be many more remote servers like this one.

But think of it: After the initial cost of the ZIP, the UMTS box and its subscription (both Sprint and AT&T now have them, and I'm told that Verizon is getting ready to unveil their version as well), your line costs and the line costs to the client on the remote broadcast are zero. And for that, you get up to 20 kHz audio response, in stereo if you like, and with very

low audio delay (latency). What's not to like? As the Internet gets more robust, this is going to be the way to go.

Currently, the Zephyr IP comes in only one configuration, a 3RU rack-mount arrangement. We have two of these, of course, and one at present resides in a Pelican Transport Case when it's not on the air. There are two new models coming out, both portable, one with a mic mixer and in roughly the same configuration and appearance as the Zephyr XStream ISDN portable unit. The other lacks the mic mixer but sports a battery pack for truly broadcasting from nowhere. Both should be out around January of 2009. We will likely be getting two of one type of those portable units. I'll have more on this product in a future issue.

### **Finally...**

I mentioned on the pages of an earlier issue about a neighboring FM station which lost its tower. I may have also mentioned about how they ended up with an STA on a tower on the other side of town, several miles closer to our own WPWX transmitter site, and within our primary coverage area. Since our two stations are a mere two FM channels apart, the temporary site of that FM station means that they are interfering with WPWX, even when operating at a fraction of the power they normally run.

There's a point here, so stay with me. As I said, the neighboring FM filed for an STA to operate at this site. The FCC approved it. We protested both the filing and the quick approval, backing it up with an interference study which I made. The CE of the other station, an old friend of mine, made a similar study and sent it to the person writing the response for the FCC. The two studies came close to agreeing with each other, but the person writing the station's response didn't see it that way, and wrote the opposite of the CE's intentions and filed it. The CE called the writer of the response and protested her misinterpretation of his message, to which she replied, and I'm not making this up, as follows: "I stand by my interpretation of what you said!"

Now stop here a moment, and let that sink in. I suggest that this statement says a lot about what's wrong with the world today. The possibilities are almost endless. That certainly explains why anyone can take the Bible to mean what one wants it to mean. It certainly puts a new slant on any negotiations about anything. It pretty much lends clarity to the concept of moral relativism. And it explains in great measure Green's Law of Debate, which states, "Anything is possible when you don't know what you're talking about."

I leave any other possible consequences to your imagination. My mind gets pretty blown just

thinking about it. Yours, too?  
Until next month.....

---

### The Portland Report

By

**John White, CBRE**  
Chief Engineer, CBC-Portland

As engineers, when we evaluate how listeners perceive our radio station, we often consider audio processors, transmitters, consoles and all the latest whiz-bang hardware that seems to pop up on a regular basis. We all work hard to make our stations the best technical quality they can be. At best, our hardware can only be half the product of this thing we call radio.

As I have often said, radio is a wonderful local media and resource for our local communities. We as broadcasters serve our audience and touch their lives on a daily basis. Satellite radio and TV can never fill that need.

In late August here in Portland, CityFest, one of the largest faith celebrations ever staged in the Pacific Northwest, attracted more 185,000 participants and 26,000+ volunteers. Waterfront Park, where the event was held most, is a frequent Portland festival gathering area, notable earlier this year for hosting a free concert and political event which attracted some 70,000. KKPZ, a supporter of the event, broadcast live from CityFest. Serving as a resource for our listeners, the celebration wrapped up with a set by Christian music superstar TobyMac and an inspiring message of hope from global evangelist Luis Palau. This broadcast was complicated by other TI problems I will mention later on. It's not just the large and prestigious events where radio serves our communities and audience.

Churches across the country often broadcast Sunday services for shut-ins and public outreach. Very often the technical side can suffer when the broadcast is just a simple tap into the church public address sound system. Here in Portland our church broadcast is much more than a PA tap. This last month, I invested engineering time working with our

local church to make their broadcast even better. Again I was reminded that much of engineering has as more to do with people than it does with hardware.

As I talked with the church's sound operator, I noticed much of the conversation centered more on how and why than it did on amplifiers and microphones. Working with our partners to provide them information, knowledge and an understanding of why some things work and others don't will pay great dividends in the broadcast product, the programming our listeners enjoy.



### Engineering Safety Alert

A project here in Portland and a comment from Ben Dawson, a PE from Seattle, reminded me that safety involves more than just the proper handling of electrical energy. Ben mentioned that a recent Washington State public health survey had found the hantavirus approaching 20% in the state rodent population.

The hantavirus is transmissible to humans. Many radio facilities using tower tuning houses and ATU enclosures which are rodent magnets, so the possibility for contact is very real. Oregon is likely to have similar rodent infection rates to the 20% found in Washington. A few minutes of research found Arizona, New Mexico, and Colorado experiencing rates approaching 30%.

Some tips if you see evidence of rodent droppings in an ATU enclosure or tuning house. Wear latex or rubber gloves and a dust mask while cleaning. Avoid raising dust that may spread the virus through the air: Do not vacuum, sweep or dust. Carefully wet down areas with disinfectant (1 cup bleach to 10 cups water) before cleaning. Your local public health outlet can provide detailed safety

information.

### Documentation

A local project here in Portland has prompted the need to document the RF portions of our phasor and ATU units. Normally it doesn't seem like much of a problem – after all, the circuits are in plain sight, so no big deal, right? Well, although I have never had an RF diagram and have had no problem with normal maintenance, what happens if there is a fire in a tuning house or an evaluation of the system is required by a third party?

In the case of KKPZ, the phasor and matching system was constructed 25 years ago using high quality products and has been maintained over the years. Our phasor and ATUs were built by Kintronic Laboratories. It took some time for KTL's Bobby Cox to find the original drawing in the archive, but find them he did. I recently received those drawings which are the original design drawings and that, as it turns out, is where the fun begins. For example, I now know phase length of the transmission lines. And I learned a great deal about design drawings, as built and modifications.

First, I have learned that our installation included a number of as-built modifications which are not included in the Kintronic drawings. Over the years, there have also been several additional

modifications, making the original drawings severely out of date. All of which raises the question, is your documentation current and up to date? Mine was not, and trust me, it can be a major task to recreate and update documentation after the fact.

### T1 Woes

Last month, I mentioned ongoing T1 problems here in Portland. Those problems are still ongoing and considerably more complicated than I would like. The studio end of the circuit has been converted to fiber with a high level of reliability. The transmitter end of the circuit remains on buried copper that was installed in the 1950s. Re-engineering the circuit and going to new pairs is likely to result in pairs that work now but fail under a different set of conditions.

I am finding the T1 reliability is highly dependent on weather, rain and temperature. Most recently (a complication that came during CityFest), I had a series of outages as the temperature passed 90 degrees. Of course when the telco tech arrived, it was cooler and the problem was gone.

I must say the telco repair and cable techs have been responsive. We are now dividing the circuit using "donor pairs" in an attempt to isolate the trouble area. This tale reminds me of a book I read as a child, "The never ending story."

---

### Rocky Mountain "Hi" The Denver Report

by  
Ed Dulaney, CSRE, CBNT, AMD  
Chief Engineer, CBC - Denver

### Arbitron PPM

Last month, our local SBE chapter meeting was a great question and answer session on the implementation of the new Arbitron "Portable People Meter" (PPM). Arbitron had three of their best and brightest attend the meeting and gave all the engineers a chance to get their questions answered about the implementation of this new technology.

Some of the most pressing questions on the system were on the topics of how it would be integrated into

the broadcast chain and what sort of fail-safe mechanism would be available to insure that the PPM

encoding would always be available. Obviously, if the PPM encoder would fail, that would be akin to your station actually going off the air. In fact, once the PPM is implemented and the old handwritten diaries are done away with, then without the PPM encoding you might as well just shut off your transmitter. Unless, of course,

you are not interested in actual ratings for your





station.

It seems to me that PPM is a good thing for radio. For too many years, radio has relied on people correctly writing down important information in the Arbitron diary. But people have this tendency to be inaccurate in their diary reporting. And it's not completely out of the question for someone to falsify their diary, even though that would be immoral if not technically illegal. The PPM cannot lie. It simply reports what it hears. And if someone decided to just sit it by the radio, recording their favorite station every day, the PPM would invalidate the results – it uses a motion sensor to insure that it's attached to an actual person and not just sitting on a nightstand somewhere.

All of my concerns about PPM were addressed at the meeting. For instance, I was concerned with how the PPM encoding would “play” with the HD Radio codec for AM broadcast. They explained that there have been extensive tests done with PPM and that the HD Radio codec passes the signal without any problems whatsoever.

The PPM encoding is done in the 2-3 kHz frequency range using a perceptual audio coding scheme. Just as with any perceptual codec, the PPM signal is “buried” in the audio, the tones effectively being masked by the audio itself. Yet the PPM receiver, a device about the size of a pager, is able to detect this signal with its built-in microphone.

One of the other questions I asked was: “How do we know that we're actually encoding?” The answer was quite simple: Arbitron provides each radio station with a receiver (actually a decoder) that will monitor the audio and activate an alarm if the PPM stream disappears from the station. This decoder can be placed either in the audio program line, before it goes to the transmitter, or on the output of an air monitor.

Further, Arbitron provides every station's primary channel in a PPM market with a main encoder and a backup encoder. In the event that the main encoder fails, a station can quickly switch to a backup unit. These encoders can be placed anywhere in the air chain, so they could be located at the studio or at the transmitter.

Note that I said that they provide encoders for the stations primary channel. If you have an HD2 or web stream that you wish to encode, then you would have to pay a fee to Arbitron for that encoder. The exception to that rule would be if you are an actual Arbitron subscriber. In that case, they will provide free encoders for all your services.

However, think for a moment about how much rack space will be used for this equipment.

Let's assume that you have one AM station, three FM stations (each of which has an HD2 stream) and Internet stream for each station. Let's also assume that you will encode every one of those feeds. That's eleven audio channels that you would need to encode. Consider that Arbitron provides two encoders and one decoder for each station. That makes for a total of 33 pieces of equipment that need to be installed to encode PPM on your stations! Holy rack space, Batman!

However, considering how much more accurate the PPM system is, compared to the outdated diary system, I think it's well worth the effort.

So when will PPM come to your market? For some areas, PPM is already a reality. And Arbitron wants to get the top 50 markets up to speed with PPM over the next few years. So, chances are that you'll have to deal with PPM sooner rather than later. Keep an eye on your local SBE chapter meeting schedules, as Arbitron has been visiting SBE chapter meetings nationwide in order to get the information out to the local engineers.

### **Tower Brought Down!**

Thankfully this didn't happen to one of the CBC stations here in Colorado, but it is one of the stations that I take care of on a contract basis.



On Monday, August 11<sup>th</sup>, I was called by the station saying that they were off the air. I dialed up the Gentner remote control and tried to get them back on the air, but nothing happened. Unfortunately, this station is in Vail, which is a two-hour drive west of Denver. Obviously I couldn't get there until after my work here at CBC-Denver was through for the day.

When I finally arrived there in the evening, I found the transmitter, a Harris MW-5B in which I had recently replaced the tubes, had a burned up plate transformer. I thought that was rather odd, so I switched them over to a backup Nautel P400 transmitter while I dug into the problem.

Had I looked up at the tower on the way in, I'd have known why the plate transformer burned up! Apparently a truck had driven too close to one of the guy wires and snagged it, causing the tower to twist and bend! This, in turn, shorted out the spark gap at the base of the tower. The gaps weren't touching, but

they were probably about the width of a sheet of paper apart. That's why the 400 watt transmitter worked, but the 5,000 watt transmitter wouldn't. And, apparently, the overloads in the MW-5B were bypassed at some time in the past so the transformer became a very expensive "fuse" for the power supply!

They operated on the damaged tower for a few days, but a tower company that they'd called to take a look at it decided that it was too much of a hazard and requested that the station give them permission to cut the tower down.

This really made me realize how important it is for us to make sure that our guy wires, where they might be in any sort of area that would have traffic of any type, are properly protected. This station in Vail is facing at least a month of time off the air until a new tower can be erected. And this is during the height of political advertising season as well! They are projecting at least a \$150,000 loss of revenue for the station, simply because a truck got a little too close to a guy wire!

Could one of our stations live with that sort of loss? Chances are that it couldn't. But there are ways to protect the guy wires so something like this doesn't happen. The best and most secure method is

to build some sort of barrier around both the guy anchor and the guy wire. The barrier should extend far enough to protect the guy wire at any point where the wire is 12 feet or less above the ground. We have just that sort of barrier, a highway guard rail actually, at the KLTT transmitter site. That particular wire crosses over an access road used by oilfield workers, so protecting that wire is very important.



Hindsight is 20/20, and the station that I contract for is already planning on having a construction company build a barrier to keep this from happening again. But the fact is that it shouldn't have happened in the first place. The worst part is that I warned them about this potential for danger a couple of months ago when I first saw it. Nothing ever came of that warning, though, as the ownership of the station changed right after that.

Until next month... Press on!

---

### Digital Diary

by

Larry Foltran

Corporate Website & Information Technology Coordinator

#### A Walk Down RAM Lane

Although advances in technology make our home and work computers faster and capable of storing more and more data, it's easy to forget how far we've come in terms of computing technology. My dad and I were recently chatting about the first computer we had in the house and boy did that bring back some memories.

For me, it all began at around 8 years old with the Commodore VIC-20. As all of my friends opened their Atari systems on Christmas morning, tearing back the wrapping paper at our house revealed a strange, typewriter style machine. This 8-bit power house of its day came equipped with



a whopping 5kb of RAM and didn't have a game in sight, which was very disappointing to me. No Asteroids... no Battlezone... no Baseball. Only a

mostly blank BASIC screen welcomed me after plugging it into the TV and turning the power on.

The VIC-20 actually didn't spend much time in our house. The endless cycle of computer upgrades began a short time later with the move to a brand new Commodore 64. Our computing power went from 5kb of the VIC-

20 to 64kb of RAM in the C-64. Although the similar initial BASIC screen was also present when starting up the C-64, this system came with a game cartridge and many more as time went on. The C-64 was, and

continues to be a very popular system. Although it retailed for around \$600 in the early 80's, collectors have recently spent three and even four times more



than that to capture a little piece of computing history. The C-64 was my first opportunity at programming and working

with a computer without solely using a joystick, although I must say that gaming was typically the motivation. My dad subscribed to a pair of popular computer magazines during that time, which each month featured several programs including a game or two. I remember spending countless hours typing lines of BASIC code into the computer, sometimes successfully and sometimes not. There were times when we'd spend well over an hour typing, just to find that

there was a mistake somewhere in the long string of code. Sometimes it would be



easier to simply start from scratch instead of going through the code, line by line, in search of the error.

A short time after, my parents invested in a tape deck for the C-64. Although very low tech, this peripheral allowed me to save the programs I typed to tape for use later. Although the recording and loading process was very slow, it was still much better than re-typing code each time I wanted to play a game. Many of the more advanced commercial games were available in tape format only, some actually on four separate tapes. I remember on several occasions spending the better part of an hour loading each tape for a specific game, only to find out as the process neared its end that we were leaving the house for one reason or another. Oh well, power off and start all over again when I returned.

Progress continued and we soon purchased an external floppy disk drive. This expanded our data saving options and, of course, the number of games that we could get. Although still a slow process, loading software enjoyed a significant boost in speed compared to the then-obsolete tape drive. The disk

drive also made it possible for me to try my hand at Flight Simulator II. Despite the fact that the slow processing speed made this game look more like a PowerPoint slide show, it sparked an interest for me that I still carry today. Also with only one portable TV in the house, "liberating" it and carrying it down to the basement also became a challenge.

It was only a few years later when my dad, always looking to upgrade, decided it was time for us to make the move



to our first IBM style PC. Extremely hesitant and honestly without a choice, I again was forced to acclimate to a new computer system. Now armed with a hard drive, 8 MHz of processing power, internal floppy drive, and a dedicated monitor, I was equipped to do some damage. My dad and I made the transition from BASIC to DOS rather quickly and become accustomed to avoiding Windows and navigating around the computer's hard drive strictly using the DOS command prompt.

From that point on it was basically a quest for more storage, better graphics and faster processing speed. Quite honestly, I think the system upgrade race will always be around. It is interesting to look back and realize that we've actually come full circle in several ways. Although we rarely, if ever, use cartridges these days, we do find ourselves



plugging one form of storage device or another into our USB ports. Computer technology has also found the way to eliminate the need for a dedicated monitor and utilize the TV once again. Apple has even found a way to dispense with the CPU tower and re-integrate all of the necessary components into one core unit similar to the VIC-20 and the C-64. Perhaps the computer designers of the 1980s did have a vision of what the future of computing would be like. Although I am able to look back on those with fond memories, I am very thankful of the advancements that have been made. I can't imagine trying to load MS Word from a tape deck each day.

...until next month!

---

The Local Oscillator  
September 2008

---

**KBRT • Avalon - Los Angeles, CA**  
*740 kHz, 10 kW-D, DA*

**KCBC • Riverbank - San Francisco, CA**  
*770 kHz, 50 kW-D/1 kW-N, DA-1*

**KJSL • St. Louis, MO**  
*630 kHz, 5 kW-U, DA-2*

**KKPZ • Portland, OR**  
*1330 kHz, 5 kW-U, DA-1*

**KLZ • Denver, CO**  
*560 kHz, 5 kW-U, DA-1*

**KLDC • Brighton - Denver, CO**  
*1220 kHz, 660 W-D/11 W-N, ND*

**KLTT • Commerce City - Denver, CO**  
*670 kHz, 50 kW-D/1.4 kW-N, DA-2*

**KLVZ • Denver, CO**  
*810 kHz, 2.2 kW-D/430 W-N, DA-2*

**KSTL • St. Louis, MO**  
*690 kHz, 1 kW-D/18 W-N, ND*

**WDCX • Rochester, NY**  
*990 kHz, 5 kW-D/2.5 kW-N, DA-2*

**WDCX-FM • Buffalo, NY**  
*99.5 MHz, 110 kW/195m AAT*

**WDJC-FM • Birmingham, AL**  
*93.7 MHz, 100 kW/307m AAT*

**WEXL • Royal Oak - Detroit, MI**  
*1340 kHz, 1 kW-U, DA-D*

**WLGZ-FM • Webster - Rochester, NY**  
*102.7 MHz, 6 kW/100m AAT*

**WRDT • Monroe - Detroit, MI**  
*560 kHz, 500 W-D/14 W-N, DA-D*

**WMUZ • Detroit, MI**  
*103.5 MHz, 50 kW/150m AAT*

**WPWX • Hammond - Chicago, IL**  
*92.3 MHz, 50 kW/150m AAT*

**WSRB • Lansing - Chicago, IL**  
*106.3 MHz, 4.1 kW/120m AAT*

**WYRB • Genoa - Rockford, IL**  
*106.3 MHz, 6 kW/65m AAT*

**WYCA • Crete - Chicago, IL**  
*102.3 MHz, 1.05 kW/150m AAT*

**WYDE • Birmingham, AL**  
*1260 kHz, 5 kW-D/41W-N, ND*

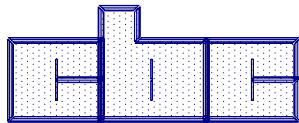
**WYDE-FM • Cullman - Birmingham, AL**  
*101.1 MHz, 100 kW/410m AAT*

**WXJC • Birmingham, AL**  
*850 kHz, 50 kW-D/1 kW-N, DA-2*

**WXJC-FM • Cordova-Birmingham, AL**  
*92.5 MHz, 2.2 kW/167m AAT*

---

CRAWFORD  
BROADCASTING  
COMPANY



Corporate Engineering  
2150 W. 29<sup>th</sup> Ave., Suite 300  
Denver, CO 80211

email address: [crisa@crawfordbroadcasting.com](mailto:crisa@crawfordbroadcasting.com)